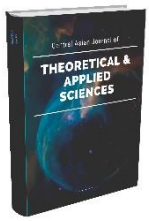

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Conversion of Solar Radiation Into Electrical Energy by Using Solar Cell

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Abstract: *Photogalvanic cell is a device which accumulates the energy from the sun for transference to electricity. The photogalvanic cell is based on photogalvanic effect. Photogalvanic effect means when sun light (as photons) strikes the photosensitizer molecule they get excited and become energized species and these high energy products jumps into low energy levels and radiate energy electrochemically. Photogalvanic cells also can be used for its good storage capacity as compared to photovoltaic cells. Photovoltaic cells are those cells in which there is direct excitation of an electron through a photon and thus producing electricity.*

In the present work the conversion of solar radiation into electric energy and its storage will be studied by using red Beet root (Beta vulgaris) extract as photosensitizer ,NTA , D-manitol used as reductant and Brij-35,Tween -80 as surfactant. Review of literature shows that very less work has been done on the natural dye sensitized solar cells So The main purpose of present work is to obtain higher conversion efficiency of the photogalvanic cell and to increase its storage capacity for commercial importance.

Introduction:

Energy is the most important requirement for human life on the earth. Due to global warming and population explosion the consumption of fossil fuels is increasing and hence the energy demands of world is not fulfilled in future and just like a challenger problem. So renewable energy sources are attracting a great deal of attention and the solar energy is the best renewable option of them because it is most abundant, cheap continuous and easily available. Although earth receives only a small fraction of energy from solar flux yet it is most promising and convenient energy resource in future.

There are many advantages to select solar energy as a renewable resources. Some of them as given below:-

1. It is the vital source of energy.
2. It is pollution free source
3. It is the continuous energy source
4. Solar energy does not require any hue.
5. It is the cheapest and easy handeling energy source.

Types of solar cell

1. Photogalvanic cell:- A device in which light is absorbed by an electrolyte solution to give energy through chemical process . It is based on photo galvanic effect . In the photogalvanic cell there are two electrode one is made of metal (Pt) which is towards of light and the other is saturated calomel electrode which is present in dark space . The reductant and photosensitizer (**Beta Vulgaris extract**) are kept between two electrode . The photosensitizer absorbs energy from light source as photons and get excited . The excited photosensitizer takes an electron from the suitable reductant and transfer this electron to metal electrode (Pt) and causing electron from the metal electrode (Pt) flow via circuit towards the saturated calomel electrode and the photosensitizerreturn in its original form . So the photo-oxidation and photo-reduction process repeated in the cell.

2. Photovoltic cell:- Photovoltaic cells are the semiconductor cells in which there is direct excitation of an electron by solar radiation (a photon) and thus producing electricity . These are generally first generation solar cell and made up by multilayered semiconductor materials like silicon . Photovoltaic cells have good conversion efficiency and need to bee charged frequently.

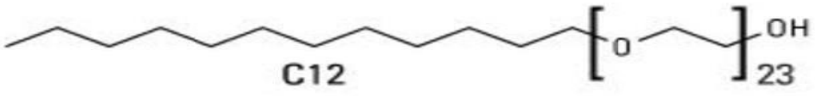
These cells are based on photovoltaic effect . Photovoltic effect means they produce directelectricity when placed in the sun light .

3. Photoelectrochemical cells(pec):- Becquerel in 1839 found that light can cause changes inthe current and voltage in some electrochemical cells PEC may be defined as a device in which the light energy changes the electode potential in open circuit and current in closed circuit.

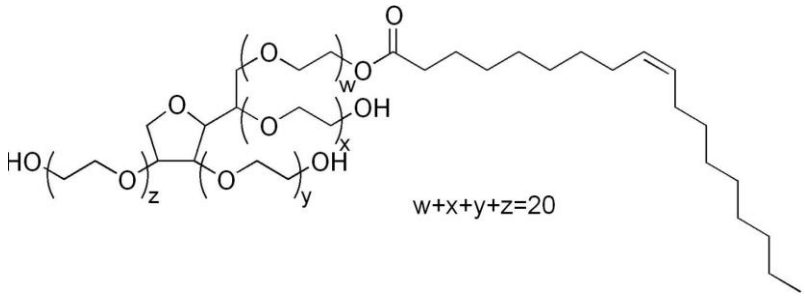
4. Fuel cell:- A device which is used for convert chemical energy into electrical energy for as long asfuel and oxidant are supplies to in it. The fuel cells are pollution free and have higher efficiency (approximate 80 -85 %) .The main disadvantage of the fuel cells that these are very expensive.

5. Dye-sensitised solar cell:- Dye sensitized solar cells converts visible light into electricity by using sensitization of the solar cell Use of naturel dyes is a promising development in the field of this technology. Naturel dyes are abundant and cause no threat to environment. Dye-sensitized solar cells are also known as **Gratzel** cells named after the developer. The DSSC is a third generationsolar cell these are made up by new materials like nanomaterials, silicon wires, organic dyes, conductive plastics and solar inks. The main purpose of DSSC is to provide solar energy moreefficient, less expensive and without any toxicity or wastage.

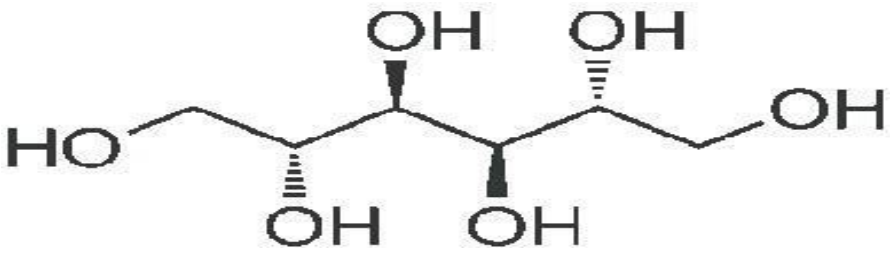
Structure of compounds used:-



Brij* 35 Detergent
MW 1225



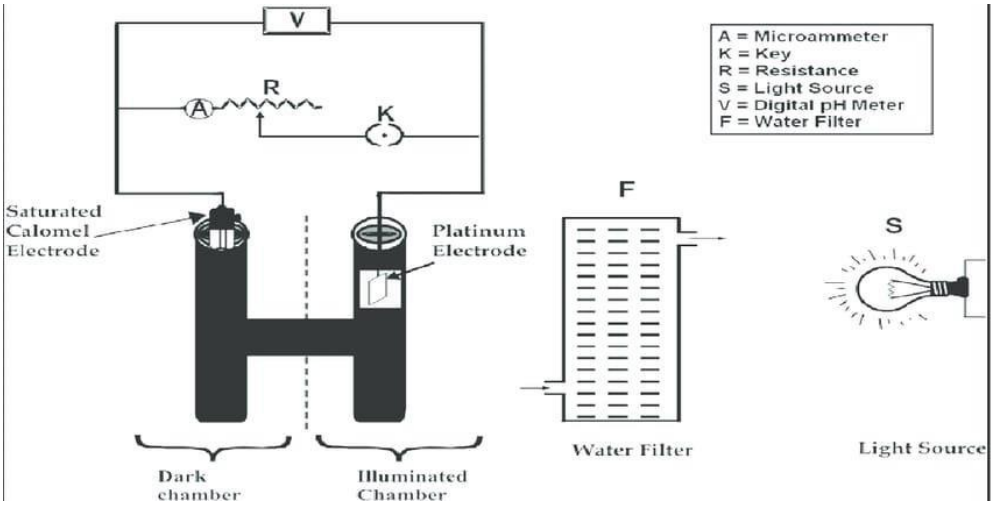
Tween-80



D-mannitol

Design of photogalvanic cell

A photogalvnic cell is a simple setup, used in laboratory .it consist of two electrode one metal electrode (pt) and other standard calomel electrode connected with pH meter (with potential) and microammeter in a sequence. A H shaped glass tube is taken as photogalvanic cell. The glass tube is also called as H cell. Whole cell is darkened either by covering with a black paper or by coating black paint.A window to illuminate the metal electrode is made in one of the arms.The H cell is filled with the solution and whole cell is covered by black film or thick paper to take dark potential.Thus prepared H cell is connected to pH meter and micro ammeter as shown in the diagram.The filter is filled with water.



Mechanism

The mechanism of photocurrent generation in the photogalvanic cell is represented as In illuminated chamber:

$Dye \rightarrow Dye^*$

$$Dye^* + R \rightarrow Dye^- + R^+$$

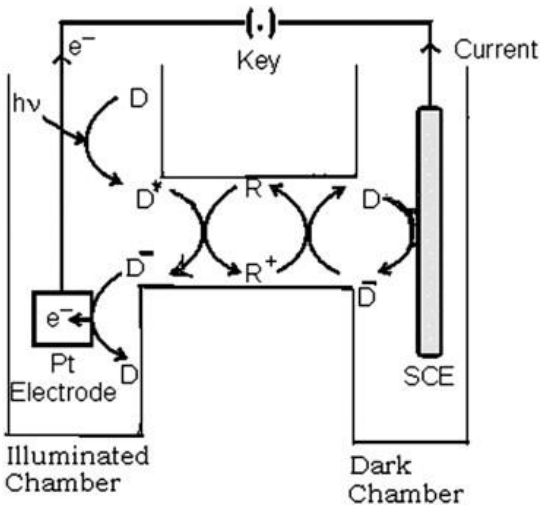
Atplatinum electrode:

$Dye^- \rightarrow Dye + e^-$

At standard calomel electrode (dark chamber)

$Dye + e^- \rightarrow Dye^-$

$Dye^- + R^+ \rightarrow R + Dye$



Conclusion:- The inference of above research is that natural dye can be used as photosensitizer in photogalvanic cell. The aim of research is to obtain higher conversion efficiency of the photogalvanic cell and to increase its storage capacity by selecting the suitable redox couple, natural dyes as photosensitizer, reductant and surfactants.

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